Comparison of Open Source RDBMS

DRAFT
WORK IN PROGRESS
FEEDBACK REQUIRED

Please send feedback and comments to s.hetze@linux-ag.de

Selection of the Candidates

As a first approach to find out which database management system fits best for our needs we take a brief look at the whole range of Open Source DBMS available. We certainly have missed some and would appreciate to get feedback and contributions to this overview. Given our limited time and ressources for this comparison, we only take a very small set of features into account for this overview.

Database	*Version*	*License*	*Access*	*Transactions*	*StoredProcs*
GDBM www.gnu.org	1.8	GPL	Hash		
Berkeley DB www.sleepycat.com	4.0.14	BSD Type	Hash	X	
SHORE www.cs.wisc.edu/shore/	1.1.1	BSD	SDL/ODL		
ZOPE www.zope.org	2.5.1	Zope PL	DTML		
mSQL www.hughes.com.au	3.0	Hughes	mSQL		
MySQL www.mysql.com	3.23.52	GPL	SQL		
PostgreSQL www.postgresql.org	7.2.1	BSD	SQL	X	X
Interbase	6.0	InterBase PL	SQL	X	X
Firebird firebird.sourceforge.net	1.0	InterBase PL	SQL	X	X
SAP-DB www.sapdb.org	7.3	GPL	SQL	X	X

Our primary goal is to find out which DBMS fits best for a project where we have to migrate a database application from Microsoft SQL server to a Open Source DBMS. This application makes heavy use of Stored Procedures. This narrows our choice to the last four DBMS. Firebird is the Open Source project based upon the Open Source release of Borland Interbase 6.0. We consider both systems to be equivalent and limit our further research to the Firebird.

Short History

PostgreSQL

Implementation of Postgres began 1996 at Berkeley. SQL language was added 1994 (replacing PostQUEL), this software release was called Postgres95. Since 1996 the name changed to PostgreSQL.

PostgreSQL has a huge and vital open source community.

Interbase / Firebird

SAP-DB

This RDBMS has started as a university project back in 1977 at Technical University of Berlin. From 1981 to 1989 the system has been marketed as DDB/4 by Nixdorf AG, later on by Cincom as Supra2. From 1992 on the technology has been licensed by Software AG for a product called Adabas D. From 1997 on the technology has been licensed by SAP for a Product called SAPDB. In 2000 SAP has released the SAPDB product under the GPL/LGPL. SAPDB has an installed base of arround 1000 systems running SAP R/3.

Data Types

For a migration project, the availibility of compatible data types is important. Although type conversion can be handled by APIs such as ODBC and JDBC, loss of accuracy or worse loss of comparibility would lead to expensive application rewrite.

The following table shows data types and their range. Since we are going to migrate from MS SQL, we take this as our reference. Colours denote data types that need further attention when transfering data into the target RDBMS, as far as we can see now. Since we have not further investigated the details of potential differences in data type operations and API handling of those types, we currently can only give our first impression of that topic. Feedback and corrections are very welcome.

MS SQL	*PostgreSQL*	*Firebird*	*SAPDB*
BINARY (n) 8000x8 bit fixed length	BIT (n) n bit fixed length		CHAR (n) BYTE 8000x8 bit fixed length
BIT 0 or 1	BOOLEAN 0/FALSE or 1/TRUE	n.a. has to be simulated by Char (Y/N) or Integer (1/0)	BOOLEAN TRUE oder FALSE
CHAR (n) 8000 bytes fixed length	CHAR (n) n bytes fixed length	CHAR (n) n bytes fixed length (max. 32k)	CHAR (n) 8000 Bytes feste Länge
DATETIME 1753-9999, 3/100 sec	TIMESTAMP -4713-1465001, 1/1000	TIMESTAMP 64 bits, 1.1.100 - 29.2. 32768, 1 min.	TIMESTAMP 0001-9999 6/100sec
DECIMAL (p,s) / NUMERIC (p,s) precision<29, s<p	DECIMAL (p,s) / NUMERIC (p,s) s<p	DECIMAL (p,s) / NUMERIC (p,s) precision<19,s<p	NUMERIC (p,s) / FIXED (p,s) precision<39,s<p

MS SQL	PostgreSQL	Firebird	SAPDB
FLOAT 8byte +/- E308	DOUBLE 8byte +/- E308	DOUBLE PRECISION 8 byte +/- E308	FLOAT / DOUBLE Prec. < 39
IMAGE Binary data up to 2GB	BYTEA unlimited length binary	BLOB unlimited (segments to 64k)	LONG BYTE Binary data up to 2GB
INTEGER +/- 2.147.483.64x	INTEGER +/- 2.147.483.64x	INTEGER +/- 2.147.483.64x	INTEGER +/- 2.147.483.64x
MONEY +/- 922.337.203.685.477,580x	Deprecated use NUMERIC (19,4)	n.a. use NUMERIC (18.4)	n.a. use NUMERIC (19,4)
nCHAR 4000 Bytes Unicode fL	MB Support CHAR	nCHAR max. 16k Unicode fL	CHAR (n) UNICODE 4000 Bytes Unicode fL
nTEXT 1GB Unicode Text vL	MB Support TEXT	n.a. use nCHAR VARYING (max. 16k Unicode fL) or BLOB	LONG UNICODE 2GB Unicode Text
nVARCHAR 4000 Bytes Unicode vL	MB Support VARCHAR	nCHAR VARYING max. 16k Unicode fL	VARCHAR (n) UNICODE 4000 Bytes Unicode vL
REAL +/- E38 (½ Float)	REAL 4byte +/-E38	FLOAT 4 byte +/- E38	
SMALLDATETIME 1900-2079, 1 min	n.a. use TIMESTAMP	n.a. use TIMESTAMP	n.a. use TIMESTAMP
SMALLINT +/- 32.76x	SMALLINT +/- 32.76x	SMALLINT +/- 32.76x	SNALLINT +/- 32.76x
SMALLMONEY +/- 214.748,364x	n.a. use NUMERIC (10,4)	n.a. use NUMERIC (10.4)	n.a. use NUMERIC (10,4)
SYSNAME VARCHAR(30)	NAME VARCHAR(30)	n.a.	
TEXT 2GB Bytes	TEXT unlimitded length	n.a. use VARCHAR (max. 32k) or BLOB	LONG [ASCII] 2GB Text
TIMESTAMP automatic time last change	Substitute with TRIGGER		Substitute with TRIGGER
TINYINT 0-255	n.a. use SMALLINT	n.a. use SMALLINT or CHAR (implicit type conversion)	n.a. use SMALLINT
Uniqueidentifier 16 Bytes		n.a.	
VARBINARY 8000x8 Bits variable L.	n.a.	n.a. use BLOB	VARCHAR (n) BYTE
VARCHAR (n) 8000 Bytes variable L.	VARCHAR (n)	VARCHAR (n) 32k variable Length	VARCHAR (n) 8000 Bytes variable L.

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MS SQL	PostgreSQL	Firebird	SAPDB
	DATE	DATE	DATE YYYY-MM-DD
	TIME	TIME	TIME hh:mm:ss:ffffff
	INTERVAL	n.a.	n.a.
IDENTITY(s,w) @@IDENTITY			SERIAL(s) SELECT MAX(s_col)

SQL 92

The SQL92 Standard is a 800 page document describing lots and lots of features. As far as we can see, there is no RDBMS out there implementing all of them. There are three levels defined for SQL92 compliance: Entry, Intermediate and Full. Instead of using these lables we prefere to list certain features described in the SQL92 standard and comparing the RDBMS regarding these Features. If you think, we have missed an important Feature to distinguish the candidates, please let us know. Feedback to complete and correct the comparison is more than welcome.

Feature	PostgreSQL	Firebird	SAPDB
INTERVAL Typen	X		
DOMAIN Typen		X	X
String Operationen	++		+
CONCAT	||	||	||
SUBSTRING	SUBSTRING		SUBSTRING
FOLD	UPPER/LOWER	LOWER	UPPER/LOWER
FORM OF USE			MAPCHAR
TRIM	TRIM		TRIM
TRANSLATION	TRANSLATE		TRANSLATE
LENGTH	CHAR_LENGTH		LENGTH
POSITION	POSITION		INDEX
CROSS JOIN	X		X
JOIN USING			X
OUTER JOIN	X	X	X
INTERSECT EXCEPT	X		X
Transaction Isolation	MVCC	Locking	Locking
ALTER TABLE	X	X	X
FROM SELECT	X	X	X
SELECT AS	X	X	X

Feature	PostgreSQL	Firebird	SAPDB
CASCADE DELETE	X		X
CASE	X		
CAST	X	X	
Multiple Character Sets	X	X	X
SCROLLED CURSOR	X		X
Named Constraints			
Logic			TRUE/FALSE/NULL

Stored Procedures

Although all three RDBMS in this comparison provide the functionality to store and call database procedures, there is nothing like a common standard how to programme these procedures and how these procedures operate in detail.

Microsoft SQL provides a feature rich programming language called Transact-SQL for use with triggers and stored procedures.

The following table shows some features and functions compared. We definitely need some feedback here. What are the most important features that need to be compared here?

	MS SQL	PostgreSQL	Firebird	SAPDB
Procedural Lanuage	Transact SQL	PL/pgSQL, PL/TCL, C		n.a.
Time Format Conversion	CONVERT(d,s,f)	TO_CHAR()		CHAR()

More Features

Again, this is just a first set of features to compare. Feedback is welcome.

Feature	PostgreSQL	Firebird	SAPDB
License	BSD	Borland PL	GPL
3rd Party Printed Dokumentation	X		n.a.
TableSpace	unlimited		unlimited
Internal Data Encryption		n.a.	n.a.
SSL / Network Traffic Encryption	X	n.a.	n.a.

Feature	PostgreSQL	Firebird	SAPDB
Kerberos Authentication	X	n.a.	n.a.
ODBC	X	X	X
JDBC	2.0		3.0
Perl	X		X
PHP	X		X
Python	X		X
GROUP / Role concept	X		X
Tracking / Auditing			
Online Backup	X		X
Online increase of DB space	Via LVM		X
Namespaces	table		owner.table
Raw Devices			X